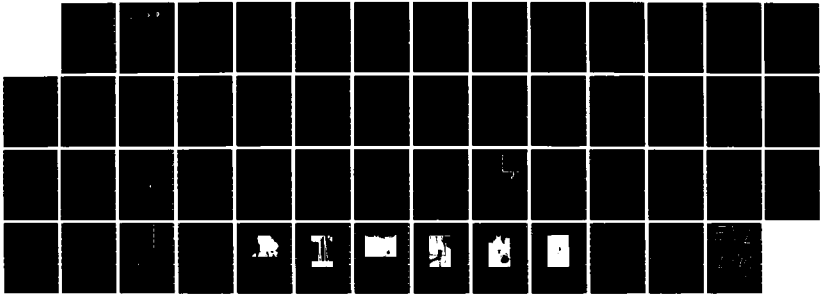
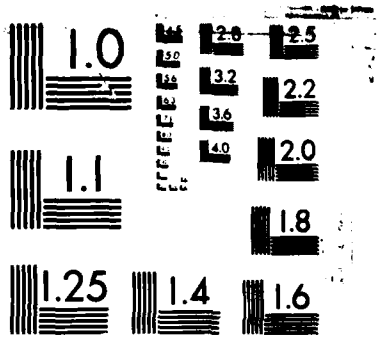
AD-A167 497 FLEET MOORING UNDERWATER INSPECTION REPORT LA MADDALENA 1/1
ITALY(U) NAVAL FACILITIES ENGINEERING COMMAND
WASHINGTON DC CHESAPEAKE DIV DEC 81
UNCLASSIFIED CHES/NAVFAC-FPO-1-81(24) F/G 13/2 NL





MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS

FPO
8124

FLEET MOORING
UNDERWATER INSPECTION REPORT
LA MADDALENA, ITALY

"Original contains color plates: All DTIC reproductions will be in black and white"

FPO 1-81 (24)
DECEMBER 81

OCEAN ENGINEERING
AND CONSTRUCTION PROJECT OFFICE
CHESAPEAKE DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
WASHINGTON, DC 20374

Unclassified
SECURITY CLASSIFICATION OF

AD-A167 497

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION
Unclassified

1b. RESTRICTIVE MARKINGS

2a. SECURITY CLASSIFICATION AUTHORITY

3. DISTRIBUTION AVAILABILITY OF REP.
Approved for public release; distribution is unlimited

2b. DECLASSIFICATION/DOWNGRADING SCHEDULE

4. PERFORMING ORGANIZATION REPORT NUMBER
FPO-1-81(24)

5. MONITORING ORGANIZATION REPORT #

6a. NAME OF PERFORM. ORG. 6b. OFFICE SYM
Ocean Engineering
& Construction
Project Office
CHESNAVFACENGCOM

7a. NAME OF MONITORING ORGANIZATION

6c. ADDRESS (City, State, and Zip Code)
BLDG. 212, Washington Navy Yard
Washington, D.C. 20374-2121

7b. ADDRESS (City, State, and Zip)

8a. NAME OF FUNDING ORG. 8b. OFFICE SYM

9. PROCUREMENT INSTRUMENT INDENT #

8c. ADDRESS (City, State & Zip)

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT #	PROJECT #	TASK #	WORK UNIT ACCESS #

11. TITLE (Including Security Classification)
Fleet Mooring Underwater Inspection Report La Maddalena, Italy

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT 13b. TIME COVERED FROM TO 14. DATE OF REP. (YYMMDD) 81-12 15. PAGES 48

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if nec.)
Fleet moorings, Underwater inspection, Mooring inspection, LaMaddalena, Italy

19. ABSTRACT (Continue on reverse if necessary & identify by block number)
On 16 April 1981, the Ocean Engineering and Construction Project Office (FPO-1) of CHESDIV was requested to provide on-site engineering support to Underwater Construction Team One (UCT-1) during the inspection of the Fleet Mooring near LaMaddalena Italy. This is a four point Mediterranean (Con't)

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT
SAME AS RPT.

21. ABSTRACT SECURITY CLASSIFICATION

22a. NAME OF RESPONSIBLE INDIVIDUAL
Jacqueline B. Riley

22b. TELEPHONE 202-433-3881

22c. OFFICE SYMBOL

DD FORM 1473, 84MAR

SECURITY CLASSIFICATION OF THIS PAGE

BLOCK 19 (Con't)

Mooring type system consisting of two stern legs attached to a pier and two bow mooring buoys. The mooring is normally utilized by a Submarine Tender (AS) class ship.

The inspection of the mooring was conducted during the period 18-25 September 1981. In general, the mooring was found to be in satisfactory condition. However, its cathodic protection and sinker systems were in poor condition and need to be replaced. The mooring design should be reviewed for possible improvements and redesign of the cathodic protection and sinker systems. After completion of this design of the cathodic protection and sinker systems. After completion of this design review, the mooring should be overhauled, the Di-Lok chain replaced with stud link, and the design changes incorporated.

DEPARTMENT OF THE NAVY
CHESAPEAKE DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
BUILDING 212, WASHINGTON NAVY YARD
WASHINGTON, D.C. 20374

IN REPLY REFER TO:
FPO-1FP2
11000
MAR 4 1982

From: Commanding Officer, Chesapeake Division, Naval Facilities Engineering Command
To: Commanding Officer, U. S. Navy Support Office, La Maddalena, Italy, FPO New York, 09533

Subj: La Maddalena, Italy, Fleet Moorings; Underwater Inspection Report

Encl: (1) Fleet Mooring Underwater Inspection Report La Maddalena, Italy

1. This Command provided on-site engineering support to Underwater Construction Team One (UCT-1) for the inspection of the Fleet Mooring near La Maddalena, Italy, during the period 18-25 September 1981.

2. As indicated at on-site briefings, the mooring was found to be in satisfactory condition. However, it's cathodic protection and sinker systems were in poor condition and need to be replaced. The mooring design should be reviewed for possible improvements and redesign of the cathodic protection and sinker systems. After completion of this design review, the mooring should be overhauled, the Di-Lok chain replaced with stud link and the design changes incorporated. Complete description of the inspection findings are contained in enclosure (1).

3. Should further information regarding mooring design or installation planning be required the CHESNAVFACENGCOM P.O.C. is Mr. A. Kurtz, autovon 288-3881 or commercial (202)433-3881.

H. P. DORIN
By direction

Copy to:
COMNAVFACENGCOM
LANTNAVFACENGCOM (Code 10)
UCT ONE (2)

ABSTRACT

On 16 April 1981, the Ocean Engineering and Construction Project Office (FPO-1) of CHESDIV was requested to provide on-site engineering support to Underwater Construction Team One (UCT-1) during the inspection of the Fleet Mooring near La Maddalena, Italy. This is a four point Mediterranean Mooring type system consisting of two stern legs attached to a pier and two bow mooring buoys. The mooring is normally utilized by a Submarine Tender (AS) class ship.

The inspection of the mooring was conducted during the period 18-25 September 1981. In general, the mooring was found to be in satisfactory condition. However, its cathodic protection and sinker systems were in poor condition and need to be replaced. The mooring design should be reviewed for possible improvements and redesign of the cathodic protection and sinker systems. After completion of this design review, the mooring should be overhauled, the Di-Lok chain replaced with stud link, and the design changes incorporated.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LA MADDALENA FLEET MOORING
UNDERWATER INSPECTION REPORT

1.0 INTRODUCTION

1.1 Background. On 16 April 1981, Commander, Atlantic Division, Naval Facilities Engineering Command requested the Ocean Engineering and Construction Project Office (FPO-1) of CHESNAVFACENGCOM to provide on-site engineering support to Underwater Construction Team One (UCT-1) during the scheduled inspection of the Fleet Mooring near La Maddalena, Sardinia, Italy. This support was to include inspection planning, the development of diver inspection procedures, on-site engineering support, recording of the raw data gathered by the UCT-1 divers, subsequent analysis of these data, and preparation of the inspection report.

1.2 Mooring Description. The La Maddalena mooring is a four point Mediterranean Mooring type system consisting of two stern mooring legs attached to a pier and two Peg Top mooring buoys at the bow at the NATO Naval Facility, St. Stefano, Sardinia, Italy. The ship using the mooring is moored at the stern to the pier structure and at the bow by the two buoy moorings (see Figure 1). As designed, each buoy mooring consists of about 480' of 3-1/2" and 3-3/8" Di-Lok riser chain, a ground ring, two 180' ground legs, and two 30K pound anchors. A small navigation buoy is attached by wire rope to each riser about 180' from the buoy, and an additional shot of chain is attached to each riser to provide additional weight between 200 and 290 feet from the buoy. The mooring is normally utilized by a permanently home-ported Submarine Tender (AS) class of ship when the ship is not deployed at sea.

1.3 Mooring History. The two bow mooring systems were removed, completely overhauled, fitted with a cathodic protection system, and reinstalled in April of 1976. In 1979, the northern (port side) buoy was replaced with a new buoy, and the southern (starboard) was removed for overhaul and replaced with a temporary cylindrical type buoy. Also during 1979, the stern leg chains were

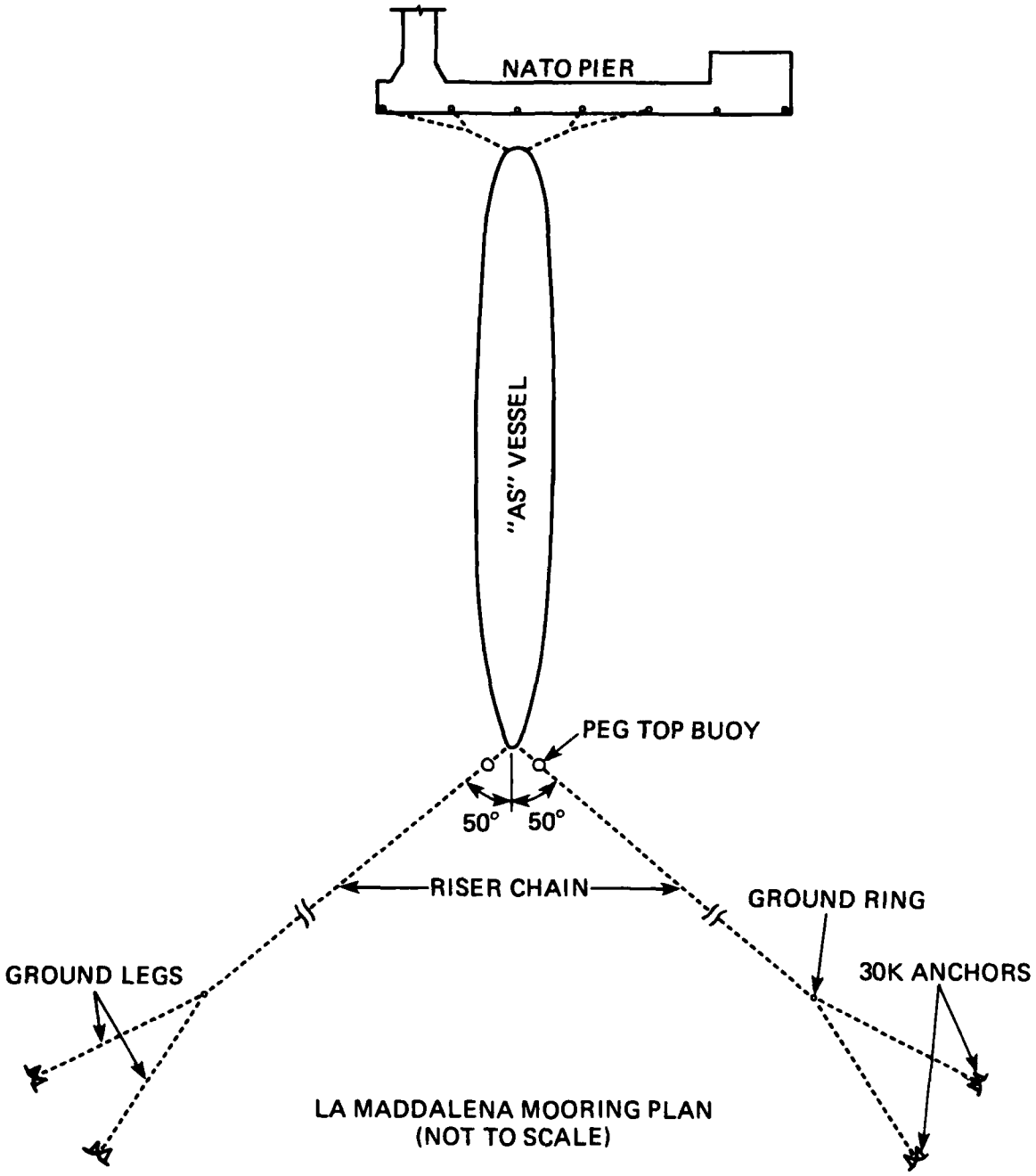


Figure 1. La Maddalena Mooring Plan
(Not to Scale)

sandblasted to bare metal and recoated, and the two navigation buoys were removed and their wire rope connecting cables dropped to the bottom. Although there have been no recent significant maintenance actions, Navy Support Office (NSO) La Maddalena personnel planned to replace the temporary southern buoy during the underwater inspection operations.

1.4 Pre-Deployment Actions. Prior to deploying to La Maddalena, numerous actions were taken by CHESNAVFACENGCOM and UCT-1 personnel:

- The assigned CHESNAVFACENGCOM Project Engineer obtained copies of the as-built drawings of the La Maddalena mooring and its cathodic protection system from LANTDIV in order to develop the procedures to be followed by the divers during the inspection.

- UCT-1 sent two experienced divers, who were to participate in the inspection, to the mooring site in July to confer with appropriate personnel from the NSO La Maddalena and the assigned Tender. During this visit, arrangements were made for the logistic and operational support required by the inspection party.

- In early August, the CHESNAVFACENGCOM Project Engineer met with members of UCT-1 to discuss in detail a draft of the Project Execution Plan. Inputs were received, changes were made, and the final version of the plan agreed upon. The Project Execution Plan was completed by the Project Engineer on 21 August, and copies forwarded to UCT-1 and LANTDIV. A copy of the Project Execution Plan is enclosed as Appendix B.

2.0 INSPECTION PROCEDURES

2.1 General. The underwater inspection of the mooring was conducted in two phases. During Phase One, with the Tender moored in place, the divers used an underwater television camera to video tape the existing condition of the lower portion of each of the buoys, their bottom jewelry, riser chains, ground rings, and visible sections of their ground legs. In addition, using

an underwater magnetic compass, an inclinometer, and a depth gauge, the divers measured (at each 20 feet of depth) the catenary angle and the bearing of the northern riser chain in order to determine the catenary profile of the riser chain while under load. Phase Two was conducted after the Tender departed the mooring. At this time, a floating crane craft (YD) provided by NSO La Maddalena, lifted each buoy and a majority of its riser chain onto the craft's deck where they were visually inspected and the wire diameters of the riser chain links measured. During the underwater/on-deck inspection of each mooring, the following specific procedures were adhered to.

2.1.1 Buoy Inspection. The surface of each buoy was visually inspected for areas of corrosion and/or damage by:

- observing the finish of the deck area and the overall condition of each hatch,
- documenting the condition of the fenders, rubbing plates, top jewelry, and any deformed areas,
- carefully cleaning three one-square-foot areas of the underwater surfaces to expose the painted surface in order to document the condition of the paint coated surface and/or any bare metal uncovered,
- checking the wear ring at the hawse pipe for cracks or other forms of metal fatigue caused by stress,
- closely observing underwater surfaces for damage or deformation.

2.1.2 Riser Chain. As installed, the riser chain consists of approximately five and a half shots of 3-3/8" Di-Lok chain (90' shots). About 250-300 feet of this chain was lifted onto the deck of the YD for visual inspection. Each shot of the riser chain was inspected, either on-deck or underwater, and sample wire diameter measurements taken in a number of different locations to ascertain the average condition of the chain. Prior to making a caliper measurement at each location, the chain was cleared of marine growth or corrosion products.

2.1.3 Ground Ring. The wire diameter of each ground ring was measured in four places using calipers. The three primary locations of these measurements were the wear points where the riser and two ground legs were attached to the ground ring.

2.1.4 Ground Legs. Where visible, the ground leg chain was inspected in the same manner as the riser chain.

2.1.5 Cathodic Protection System. Each riser chain is cathodically protected by 60-pound aluminum anodes and a 3/4"-diameter galvanized wire rope continuity cable which passes through every fourth link. Contact between the cable and chain was noted and the condition of the wire was checked for breaks, kinks, etc. Each anode was inspected for condition, size, and whether its deterioration was uniform or not. Using an underwater voltmeter, measurements of electric potential were taken on the chain at each anode and at two points between anodes in order to determine whether adequate and continuous cathodic protection was being provided. The ground legs of both moorings were not equipped with cathodic protection systems.

3.0 INSPECTION SUMMARY

3.1 Inspection Sequence. The inspection team arrived in La Maddalena on the morning of 17 September 1981 and met with NSO personnel to ensure that all requested support was available and to obtain and review any documentation concerning the usage and maintenance of the mooring which was not previously available.

The inspection of the mooring was conducted during the period 17-25 September 1981. During the first three days, a Tender was in the mooring and the riser chains were under tension. On 20 September, the AS departed the mooring, and the remainder of the inspection was conducted under a no-load condition. At the completion of the inspection, the Project Engineer briefed NSO personnel on the preliminary results.

3.2 Replacement Buoy's Condition. Prior to the inspection, the spare buoy, which was to replace the temporary southern buoy, was jointly inspected by the Project Engineer and NSO personnel. It was found to be in unsatisfactory condition due to deep pitting of the underwater side panels, evidence of fatigue in the welds, hawse pipe rust and cracks, internal water and sand, and lack of a rubbing casting at the bottom of the hawse pipe. The decision was made by NSO personnel that this buoy would not be used in the mooring.

3.3 Inspection Results. Overall, the La Maddalena fleet mooring was found to be in satisfactory condition. Mooring components showed little signs of wear or corrosion and were covered with only minor marine growth. The orientation of the exposed portion of the ground legs of both the northern and southern moorings appeared to be as designed. The two stern leg assemblies and their associated bollards were in good condition.

However, there were two major deficiencies noted. First, the installed cathodic protection system was in poor condition with most of the anodes either missing or hanging loose from the chain by the continuity cable. Second, in both moorings, the majority of the extra shot of chain attached to the riser as additional weight had broken away from the riser chain and was lying on or near the bottom. In this condition, its capability to provide additional weight is minimal.

Specific data concerning the findings observed during this inspection are contained in Annex A.

4.0 COMMENTS AND RECOMMENDATIONS

As a result of the analysis of the data gathered during the inspection, the following comments/recommendations are made:

- The La Maddalena fleet mooring appeared to be in satisfactory condition and suitable for usage by assigned fleet units.

- During the next overhaul, the Di-Lok chain utilized in the two bow moorings should be replaced with stud-link chain.

- The cathodic protection systems of both bow moorings were in unsatisfactory condition and should be replaced. In addition an improved method of attaching the anodes to the chain (other than by welding) needs to be devised.

NOTE: During long-term submergence required of fleet mooring chain, Di-Lok chain has been observed to show a mode of failure by means of corrosion products forming in the interior of the chain links due to water migration along the metal-to-metal interface formed during manufacture. Di-Lok chain is fabricated by forging together separated male and female portions of the chain links. The formulation of corrosion products in Di-Lok chain is not readily observable by divers, until the metal-to-metal interface ("lip") begins to swell or spread apart due to the expansion/buildup of corrosion products. However, this condition was not observed during the diver or surface inspections.

In addition, Di-Lok chain is more susceptible to hydrogen embrittlement by the application of a cathodic protection system. This results in a reduction of useful service life of the chain due to fatigue. The welding of anode brackets to chain links may also have reduced the useful life of those individual links.

- The major portions of the double shots of chain initially attached to the risers of both bow moorings have broken away and have little remaining capacity to act as sinkers. It is recommended that the mooring design be reviewed in order to determine whether an improved sinker system is necessary.

- When a Tender is not in the mooring, the stern leg assemblies should be stored on the pier and not permitted to hang in the water as is the current practice.

- The 2-1/2" shackle connecting the 3-1/2" riser chain to the buoy in the southern bow mooring is undersized and unnecessary and should be removed.

- The bottom of the hawse pipe of the northern Peg Top buoy should either be fitted with a rubbing casting or preferably replaced with a tension bar type buoy.

- A refurbished tension bar type Peg Top buoy should be installed in the southern bow mooring in order to meet design specifications.

- Although the upper surfaces of both buoys were repainted during the inspection, a standard Navy "Topside White" paint was applied. Per NAVFACENGCOM MO-124 specifications, fleet mooring buoys should be coated with a Navy three coat apoxy-polyamide system (MIL P-24441). The first paint coating should be a green primer (Formula 150), the second a haze gray (Formula 151), and the third, a white coating (Formula 152).

- The overall mooring design should be reviewed with particular emphasis on improving the designs of the cathodic protection and sinker systems. Upon completion of this review, the mooring should be overhauled and design changes incorporated.

APPENDIX A
MOORING INSPECTION RESULTS

This Appendix contains detailed inspection data and schematics of the various mooring components. Appendices A-I through A-III contain specific information concerning the stern leg system and the port and starboard bow moorings.

APPENDIX A-I
STERN LEG ASSEMBLIES

1.0 INSPECTION SUMMARY

1.1 Leg Description. Each of the two stern leg assemblies contained a mooring bridle, one end of which was stopped off on the stern deck of the ship while the other end was attached to an equalizer. The ends of the 125' lengths of chain running through the equalizers were attached to spider "B" plates, each of which was attached to eleven links of chain around a bollard, as show in Figures A-I-1 and A-I-2. All of the chain in the stern leg assemblies was 2-3/4" Di-Lok.

1.2 Findings. All of the chain was coal tar epoxy or black paint coated and, with all of the sample wire diameter measurements taken showing greater than 90 percent of the original size, it appeared to be in good condition. Those links of chain which passed through the starboard equalizer had lost about 50% of their coating due to rubbing, and some light rust had formed. The equalizers were also coated, but about 30% of their surface areas had some light rust. The swivel above the equalizer, in each of the mooring bridles, contained a notch on each side of the lower wire, as shown in Figure A-I-2. These notches, however, did not appear to be caused by wear, and the swivels may have been cast this way during fabrication.

1.3 Conclusions/Recommendations. When the submarine Tender departs the mooring, the stern leg assemblies are presently dropped into the water and left hanging from the bollards. Thus, the majority of these assemblies are underwater about 20 percent of the time. It is recommended that a portable crane be utilized to lift the leg assemblies to the pier for storage when the ship deploys.

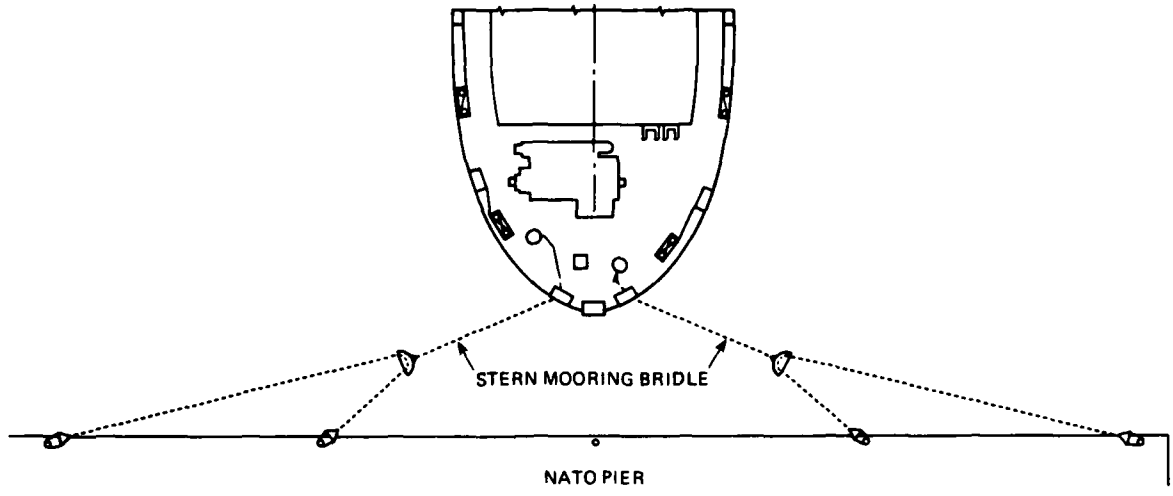


Figure A-I-1. La Maddalena Mooring, Stern Legs

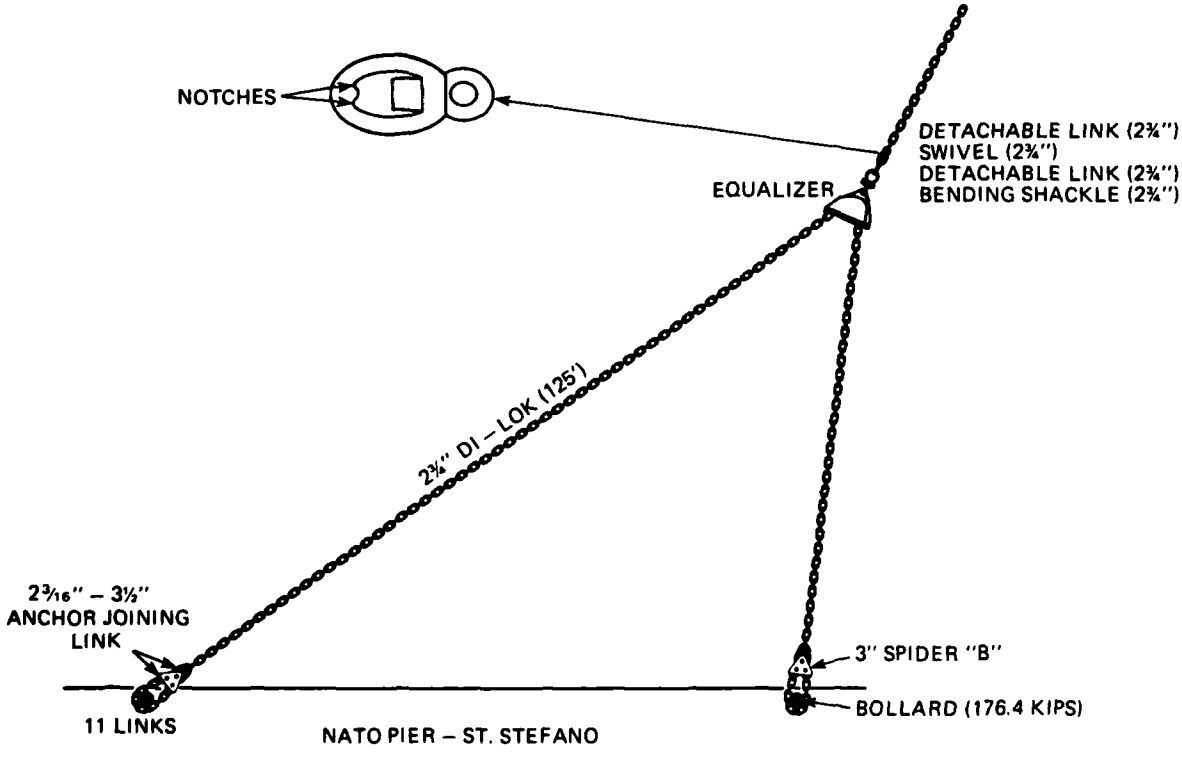


Figure A-I-2. La Maddalena Fleet Mooring, Stern Leg Assembly
(Not to Scale)

APPENDIX A-II
NORTH BOW MOORING

1.0 INSPECTION SUMMARY

1.1 Diving Operations. The underwater inspection commenced on 18 September with the initial UCT-1 divers taking inclinometer readings along the catenary of the northern mooring's riser chain every 20' of depth until the bottom was reached at about 125'. In addition, a color video recorder was used to photograph the mooring from the bottom of the buoy down the riser chain to the ground ring. The video cassette requires extensive editing, after which, it will be maintained in CHESDIV files.

With a Tender in the mooring, an underwater voltmeter was then used to obtain galvanic readings of mooring components. Table A-II-1 contains the measurements obtained from under the buoy to the 240th link (about 265') down the riser chain. After the ship departed the mooring additional voltmeter readings were taken and the results presented in Table A-II-2.

1.2 On Deck Operations. When the Tender left the mooring, the assigned YD was moved into position near the northern buoy. The buoy and about 280' of riser chain were brought up on deck. The buoy's cone shaped bottom section was scraped to remove the one to three inches of crusted marine growth, and the remainder of the buoy from the lower fender up to the deck plate was cleaned, wire brushed, and repainted. It was noted during the inspection of the buoy that there was no rubbing casting or other chafing protection installed in the bottom of the hawse pipe, and the bottom of the hawse pipe was flared outward.

The riser chain was disconnected from the buoy at the connecting "F" shackle, and the upper 20 links were removed by cutting the 20th link with an acetylene torch. The 21st link was then connected to the "F" shackle.

Table A-II-1. Underwater Voltmeter Readings, Northern Mooring
(Ship in the Mooring)

Link No.	Approximate Depth (FT)	Reading (Volts)	REMARKS
1	2	-.936	First chain link below the buoy
10	6	-.946	
20	13	-.950	
25	17	-.946	
30	21	-.952	
38	27	-.952	
40	28	-.954	
50	35	-.950	Anode loose, hanging by wire rope continuity cable
60	43	-.948	
70	50	-.948	
80	57	-.945	About 75' depth
88	62	-.960	
90	63	-.944	
100	71	-.941	
110	78	-.953	Anode attached to link
120	85	-.940	
125	89	-.939	Anode attached to link
130	93	-.931	
140	100	-.931	
142	101	-.900	Anode loose, hanging by continuity cable anode attached to link
153	111	-.924	
160	115	-.901	
170	122	-.902	On the bottom at 122' FSW
180	122	-.889	No anodes visible
190	122	-.885	No anodes visible
200	122	-.901	On bottom 125' FSW
203	122	-.951	
210	122	-.884	
220	122	-.872	
230	122	-.875	
240	122	-.851	

Note: The submarine Tender has an impressed current corrosion control system operating while the ship is in the mooring.

Table A-II-2. Underwater Voltmeter Readings, Northern Mooring
(No Ship in the Mooring)

Link No.	Approximate Depth (FT)	Reading (Volts)	REMARKS
5	10	-.466*	Less than half the measurement observed with the ship in the mooring (cause unknown)
18	25	-.970	
36	45	-.971	
55	65	-.969	

*Reading rechecked several times by divers.

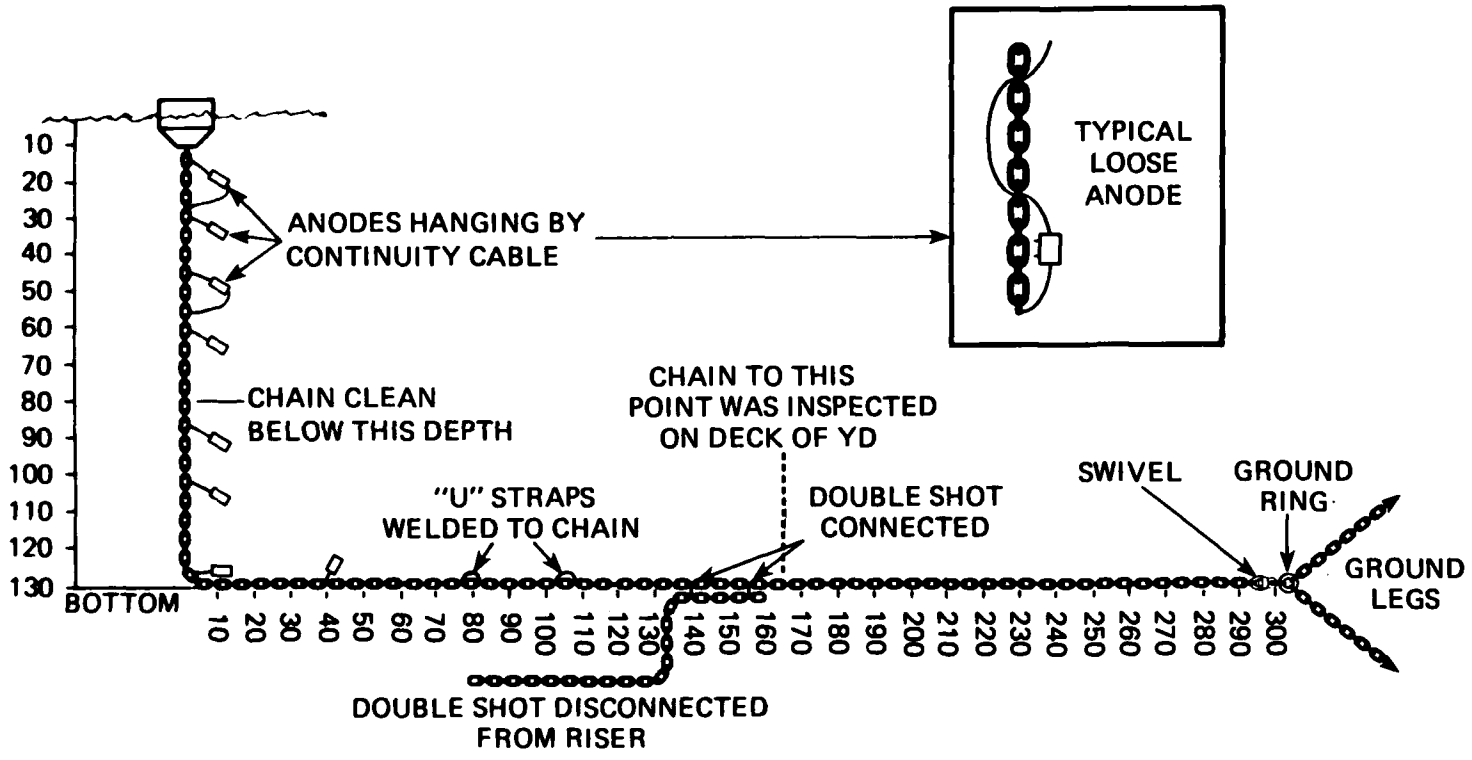
The riser chain was then examined for wear and corrosion. The upper portion of the riser chain was fouled with light to medium marine growth, but below about 80' in depth, the chain was fairly clean. Single and double link measurements of chain link wire diameters were taken and the cathodic protection system and the double shot chain sinker were closely observed. At the completion of the on-deck portion of the inspection, the riser chain and buoy were returned to their proper positions. A schematic of the mooring is presented in Figure A-II-1.

1.3 Findings. Overall, this mooring appeared to be in satisfactory condition and suitable for usage by fleet units.

1.3.1 Buoy. The upper section of the northern buoy was repainted on the deck of the YD during the inspection and, except for the lack of a rubbing casting or other chafing protection at the bottom of the hawse pipe, the buoy was in good condition.

1.3.2 Chain Assembly. The riser and exposed ground legs show no visible signs of excessive wear or corrosion. All single and double link wire diameter measurements taken were well within the minimum tolerance of $\geq$ 90% of initial size.

1.3.3 Ground Leg Orientation. Observation of about 40' of each of the exposed ground legs (before they became buried in the mud bottom) indicated that the leg orientation was satisfactory.



NOTES:
1. 79 LINKS PER SHOT – 1.1 FT PER LINK
2. UPPER SHOT HAS 23.1' REMAINING PLUS WHAT IS IN HAWSE PIPE

Figure A-II-1. North Bow Mooring Schematic After Removal of Twenty Links

(Not to Scale)

1.3.4 Cathodic Protection System. This system was in poor condition. Most anode mounting brackets had broken loose from the chain links, and many anodes were dangling from the riser chain by the wire rope continuity cable. In general, contact between the continuity cable and the chain was poor, and the continuity cable was broken in numerous places along the length of the riser chain.

1.3.5 Double Shot Sinker. Over two thirds of the shot of chain, originally designed to act as a sinker, had broken away from the riser. Only the lower 25-28 feet were attached by "U" straps. In this configuration, most of the double shot rested on the bottom and provided little added weight to the riser and thus, little capability as a sinker.

1.4 Conclusions and Recommendations. In general, this mooring appears to be in satisfactory condition. However, the cathodic protection system and double shot sinker are in need of repair, and the internal condition of those links to which anode studs were welded is questionable. It is recommended that the design of this mooring be reviewed in order to develop improved cathodic protection and sinker systems. Based on the results of the design review, the mooring should be overhauled and necessary design changes incorporated. In addition, the installed Di-Lok chain should be replaced with stud link chain, and the buoy's hawse pipe should be fitted with a rubbing casting, or preferably, replaced with a tension bar type buoy.

ITEM	SIZE	LOCATION OF MEASUREMENT	CONDITION SAT	CONDITION UNSAT	REMARKS
Buoy	12' x 9'6"		✓		Peg Top - Hawsepipe Riser Chain Type
Coating			✓		Section from bottom fender up cleaned and painted on deck of YD
Deck Plate			✓		Section from bottom fender up cleaned and painted on deck of YD
Fenders (Wood)			✓		Section from bottom fender up cleaned and painted on deck of YD
Bottom			✓		Marine growth scraped off on deck of YD. No rubbing casting in hawsepipe
Buoy (Bottom Jewelry)					
Chain Link	3 1/2"		✓		From Hawsepipe
F Shackle	3 5/16"		✓		Oblong Pin
F Shackle	3 5/16"		✓		Oblong Pin
Riser Chain	3 3/8" - 3 1/2"		✓		After removing top 20 links, all Di-Lok
		(Link No.) 1 & 2	✓		First link under buoy. Double link measurement 6 5/8"
					Link number 5 - anode hanging by one wire.
		16	✓		Single link measurement 3 5/16"
					Link number 20 - anode loose
		34 & 35	✓		Double link 6 11/16"
		45 (Top)	✓		Single link 3 5/16"
(Continued on next page)					

1. FACILITY: NSO LA MADDALENA
2. MOORING NO.: NORTH
3. TYPE/CLASS MOORING: RISER/MED MOOR
4. LAT: LON: SANTO STEFANO, Sardinia, Italy
5. INSPECTION DATE: 18-25 Sept 1981
DIVERS: UCT-1
WATER DEPTH: 125'
SUPERVISOR: K.R. Cooper
INITIALS:

MOORING INSPECTION REPORT

ITEM	SIZE	LOCATION OF MEASUREMENT	CONDITION SAT	CONDITION UNSAT	REMARKS
		(Link No.)			Link number 49 - anode hanging on one wire.
		62 (Bottom)	✓		Single link 3 5/16"
					Link number 68 - anode hanging by one wire.
		72 (Top)	✓		Single link 3 3/8"
		79 (Top)	✓		Single link 3 3/8"
		80 (Top)	✓		Single link 3 3/8". Chain beginning to be free of marine growth (88'depth)
		86 (Bottom)	✓		Single link 3 7/16"
					Link number 93 - one side of anode connected to welded stud
		105 (Top)	✓		Single link 3 3/8" - anode hanging by one wire
					Link number 123 - wire rope hanging from here to bottom
		131 & 132	✓		Double link 6 3/4". Anode hanging by one wire from link no. 132.
		136 & 137	✓		Double link 6 7/8". Link no. 137 is detachable.
					Link number 138. "U" strap welded to link. Navigation buoy wire
					attached.
		167 & 168	✓		Double link 6 13/16". "U" strap welded to link.
					Link number 187 - "U" strap welded to link.
(Continued on next page)					

MOORING INSPECTION REPORT

Page 2 of 3

1. FACILITY: NSO LA MADDALENA
2. MOORING NO.: NORTH
3. TYPE/CLASS MOORING: RISER/MED MOOR
4. LAT: LON: SANTO STEFANO, Sardinia, Italy
5. INSPECTION
DATE: 18-25 Sept
DIVERS: UCT-1
WATER DEPTH: 125'
SUPERVISOR: K.R. Cooper
INITIALS:

ITEM	SIZE	LOCATION OF MEASUREMENT	CONDITION SAT	CONDITION UNSAT	REMARKS
		(Link No.) 191 & 192	✓		Double link 6 3/4". "U" strap welded to link.
					Link number 217 is a detachable
					Link number 218. "U" strap welded to link. Double shot attached
					(chain clump)
		233 & 244	✓		Double link 6 3/4". "U" strap welded to link. End of double shot
					towards ground ring. Approximately 160' more riser to G.R. Swivel
					3 links before G.R..
Ground Ring	5 1/4"		✓		On bottom, attached to ground legs by two 3 5/8" anchor joining links.
Ground Leg A chain	3 1/2"		✓		Orientation satisfactory
Ground Leg B chain	3 1/2"		✓		Orientation satisfactory

SUMMARY: Satisfactory condition. No rubbing casting in buoy hawse pipe. Cathodic protection system in poor condition (loose anodes and broken wires). Most of double chain shot (clump) broken loose from riser - only bottom 25-28 feet attached.

MOORING INSPECTION REPORT Page 3 of 3

1. FACILITY: NSO LA MADDALENA
2. MOORING NO.: NORTH
3. TYPE/CLASS MOORING: RISER/MED MOOR
4. LAT: SANTO STEFANO, LON: Sardinia, Italy
5. INSPECTION: DATE 18-25 Sept 1981; DIVERS UCT-1; WATER DEPTH 125'; SUPERVISOR K.R. Cooper; INITIALS

APPENDIX A-III

SOUTH BOW MOORING

1.0 INSPECTION SUMMARY

1.1 Diving Operations. The underwater inspection of the southern La Maddalena bow mooring was conducted in a manner similar to the northern buoy. Video cassette tapes were taken of the underwater as-built mooring components. Underwater voltmeters were used to check the cathodic protecton system, and the readings the divers obtained are depicted in Tables A-III-1 and A-III-2.

1.2 On Deck Operations. When the ship departed the mooring on 20 September, the buoy and about 270' of riser chain were inspected on the deck of the YD. The bottom of the cylindrical shaped buoy was scraped to remove approximately one inch of marine growth, and the remainder of the buoy, from the lower fender up, was cleaned and repainted. Again, the upper twenty links of the riser chain were removed.

Table A-III-1. Underwater Voltmeter Readings, Southern Mooring (A Ship in the Mooring)

Link No.	Approximate Depth (FT)	Reading (Volts)	REMARKS
1	2	-.940	
10	7	-.943	Only two anodes attached to the chain. All other anodes are loose and hanging from wire rope continuity cable
20	14	-.942	
30	21	-.942	
40	28	-.952	
50	36	-.952	
54	39	-.952	
60	43	-.941	
64	46	-.942	
70	49	-.939	
72	51	-.940	
80	56	-.937	
89	63	-.941	
90	64	-.939	
100	71	-.939	
110	78	-.933	
120	85	-.931	
130	92	-.925	
140	100	-.921	

Table A-III-1. Continued

Link No.	Approximate Depth (FT)	Reading (Volts)	REMARKS
149	106	-.878	
150	107	-.874	
160	114	-.877	
170	121	-.876	
180	128	-.870	Chain on bottom
190	128	-.871	
200	128	-.870	

Table A-III-2. Underwater Voltmeter Readings, Southern Mooring (No Ship in the Mooring)

Link No.	Approximate Depth (FT)	Reading (Volts)	REMARKS
5	5	-.791*	*About 80% of the measurement obtained with a ship in the mooring
18	20	-.975	
36	40	-.974	
55	60	-.971	

*Reading rechecked several times by divers

A 2-1/2" shackle connected the 3-3/8" and 3-1/2" riser chain to the buoy. The pin of this shackle was necked down from wear and was replaced during the inspection.

Measurements of the wire diameter of links of the riser chain were all well within tolerance ($\geq$ 90% of original size) and little wear and/or corrosion was observed. The cathodic protection system was visually observed as well as the condition of the double shot chain sinker system. A schematic of the mooring is contained in Figure A-III-1.

1.3 Findings. With little wear and corrosion noted, this mooring was in satisfactory condition and suitable for fleet use.

1.3.1 Buoy. As with the northern buoy, the southern "temporary" buoy was found to be in good condition and was cleaned, scraped, and partially repainted on the deck of the YD.

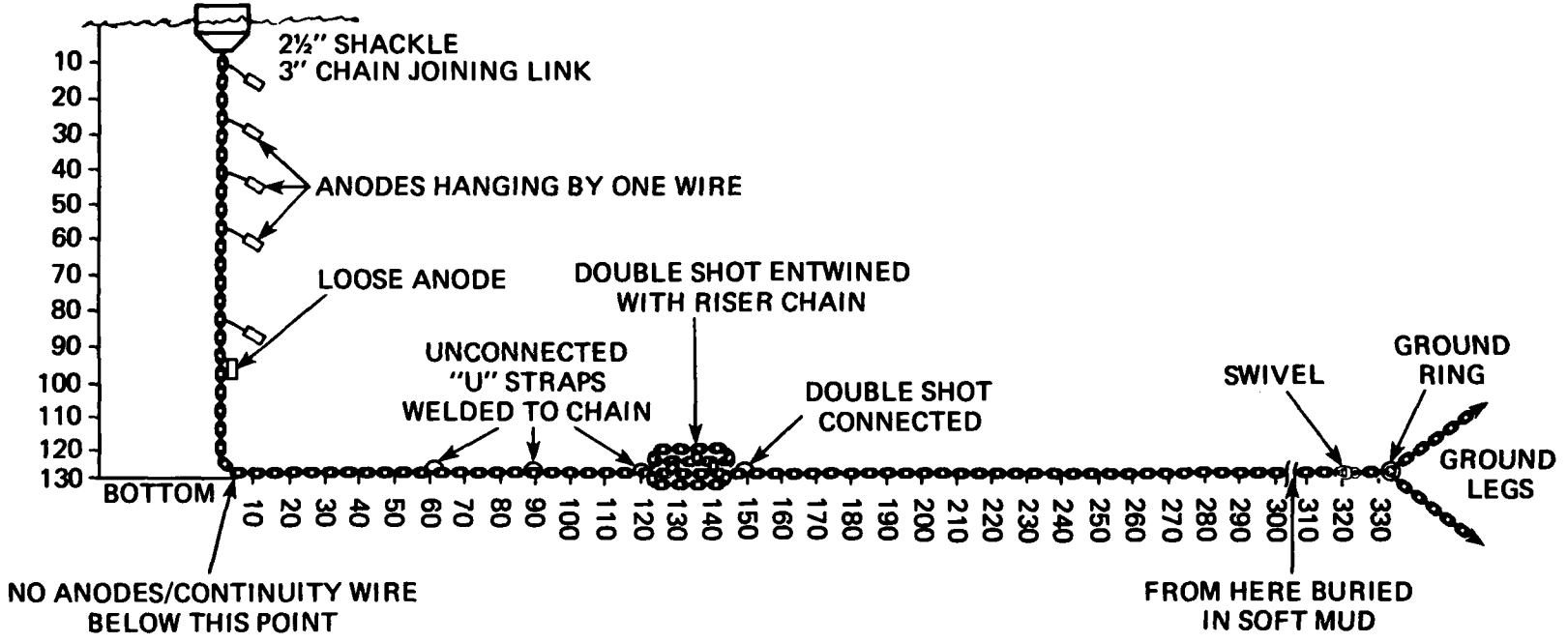


Figure A-III-1. South Bow Mooring Sketch, After Removal of Twenty Links
(Not to Scale)

1.3.2 Chain Assembly. The riser chain and visible portions of the ground legs showed little signs of wear or corrosion, and all sample-link wire diameters were well within tolerance. However, compared to the rest of the chain assembly, the 2-1/2" shackle connecting the riser to the buoy was undersized and could possibly fail under peak loads.

1.3.3 Ground Leg Orientation. Observation of approximately 35' of each of the ground legs (before they entered the bottom) indicated that the leg orientation was satisfactory.

1.3.4 Cathodic Protection System. The cathodic protection system was unsatisfactory and in need of repair. Most anodes were either missing or loose, and below 130' from the buoy, there was no evidence that anodes or wire rope continuity cable were ever installed.

1.3.5 Double Shot Sinker. The double shot of chain, originally attached to this riser as a sinker, was connected to the riser only by one "U" strap at its lower end. The remainder of the double chain shot and remnants of the old navigation buoy connecting cable were intertwined with the riser chain.

1.4 Conclusions and Recommendations. The southern bow mooring is considered to be in satisfactory condition for fleet usage, but the temporary buoy should be replaced with a permanent fleet mooring buoy. In addition, the apparently undersized and unnecessary 2-1/2" shackle, which connected the riser chain to the buoy via a 3" detachable link, should be removed.

The cathodic protection system should be overhauled and replaced. Moreover, a review of the design of the mooring should be undertaken to determine whether the double shot sinker chain is actually required or whether another type clump system would be more advantageous. At the completion of this design review, the mooring should be removed, overhauled, design changes incorporated, and the Di-Lok chain replaced with stud link.

ITEM	SIZE	LOCATION OF MEASUREMENT	CONDITION SAT	CONDITION UNSAT	REMARKS
Buoy	10'6"x 6'6"		✓		Cylindrical - Bar Riser Type
Coating			✓		Section from bottom fender up cleaned and painted on deck YD
Deck Plate			✓		Section from bottom fender up cleaned and painted on deck YD
Fenders (Wood)			✓		Section from bottom fender up cleaned and painted on deck YD
Bottom			✓		About 1 inch marine growth scraped off
Buoy (Bottom Jewelry)					
Shackle	2 1/2"		✓		Shackle pin showed shiny worn area. Replaced shackle pin.
Detachable Chain Link	3"		✓		Attaches riser to shackle. No lead plug in pin hole. Replaced lead plug.
Riser Chain	3 3/8" 3 1/2"	BY LINK			After removing top 20 links. All Di-Lok chain
		(Link No.) 7	✓		Double Link 6 3/4" - anode connected by one stud only.
		20	✓		Double Link 6 3/4" - anode hanging from chain by one wire.
		31	✓		Double Link 6 5/8"
		40	✓		Double Link 6 3/4"
					Link 46 anode hanging by one wire.
		47	✓		Double Link 6 3/4"
					Link 52 is Chain Connecting Link
(Continued on next page)					

1. FACILITY: NSO LA MADDALENA
2. MOORING NO.: SOUTH
3. TYPE/CLASS MOORING: RISER/MED MOOR
4. LAT: LON: SANTO STEFANO Sardinia, Italy
5. INSPECTION DATE: 18-25 Sept 1981
DIVERS: UCT-1
WATER DEPTH: 128'
SUPERVISOR: K.R. Cooper
INITIALS:

MOORING INSPECTION REPORT

ITEM	SIZE	LOCATION OF MEASUREMENT	CONDITION		REMARKS
			SAT	UNSAT	
		(Link No.)			Link 56. Attached anode
		59	✓		Double Link 6 5/8". Anode connected to only one stud.
					Link 81. Anode hanging by one wire.
		92	✓		Double Link 6 3/4". Anode loose from both studs.
		109	✓		Double Link 6 5/8"
					Link 130. Has studs but anode missing.
					Link 132. Chain joining link.
		133	✓		Double Link 6 3/4". "U" strap with 1 1/4" Nav Buoy wire attached. Cut wire
		148	✓		Single Link 3 5/16"
		166	✓		Double Link 6 11/16"
		176	✓		Double Link 6 3/4". Welded "U" strap but nothing attached.
		201	✓		Double Link 6 3/4". Broken "U" strap attached.
					Link 202. Chain connecting link.
					Link 221. Broken "U" strap attached.
		244	✓		Double Link 6 11/16"
					Link 247. Welded "U" strap holding lower end of double shot (clump)
(Continued on next page)					

MOORING INSPECTION REPORT

1. FACILITY: NSO LA MADDALENA
2. MOORING NO.: SOUTH
3. TYPE/CLASS MOORING: RISER/MED MOOR
4. LAT: SANTO STEFANO LON: Sardinia, Italy
5. INSPECTION DATE: 18-25 Sept. 1981
DIVERS: UCT-1
WATER DEPTH: 128'
SUPERVISOR: K.R. Cooper
INITIALS:

ITEM	SIZE	LOCATION OF MEASUREMENT	CONDITION		REMARKS
			SAT	UNSAT	
		(Link No.)			Link 282. Chain connecting link.
		328	✓		Single Link 3 5/16"
		368	✓		Single Link 3 5/16"
Ground Ring	5 1/4"				Buried 12-18" in soft mud
Ground Leg A Chain					Both buried - orientation
Ground Leg B Chain					appears good.

SUMMARY: Satisfactory Condition. Cathodic protection system in poor condition due to missing/loose anodes. No evidence anodes or continuity wire ever installed below 130' depth. Only bottom end of double shot attached to riser.

MOORING INSPECTION REPORT

1. FACILITY: NSO LA MADDALENA
2. MOORING NO.: SOUTH
3. TYPE/CLASS MOORING: RISER/MED MOOR
4. LAT: LON: SANTO STEFANO Sardinia, Italy
5. INSPECTION DATE: 18-25Sept 1981
DIVERS: UCT-1
WATER DEPTH: 128'
SUPERVISOR: K.R. Cooper
INITIALS:

APPENDIX B

PROJECT EXECUTION PLAN
MOORING INSPECTION
LA MADDALENA ITALY

1.0 PURPOSE: The purpose of this plan is to accurately define the responsibilities of the task team and to provide a comprehensive plan of action for the inspection of a two-buoy Mediterranean type bow mooring at La Maddalena. Figure 1 depicts the geographical position of the mooring site. Underwater Construction Team One will provide underwater inspection personnel and CHESNAVFACENGCOM, Code FPO-1, will provide an engineer for technical support.

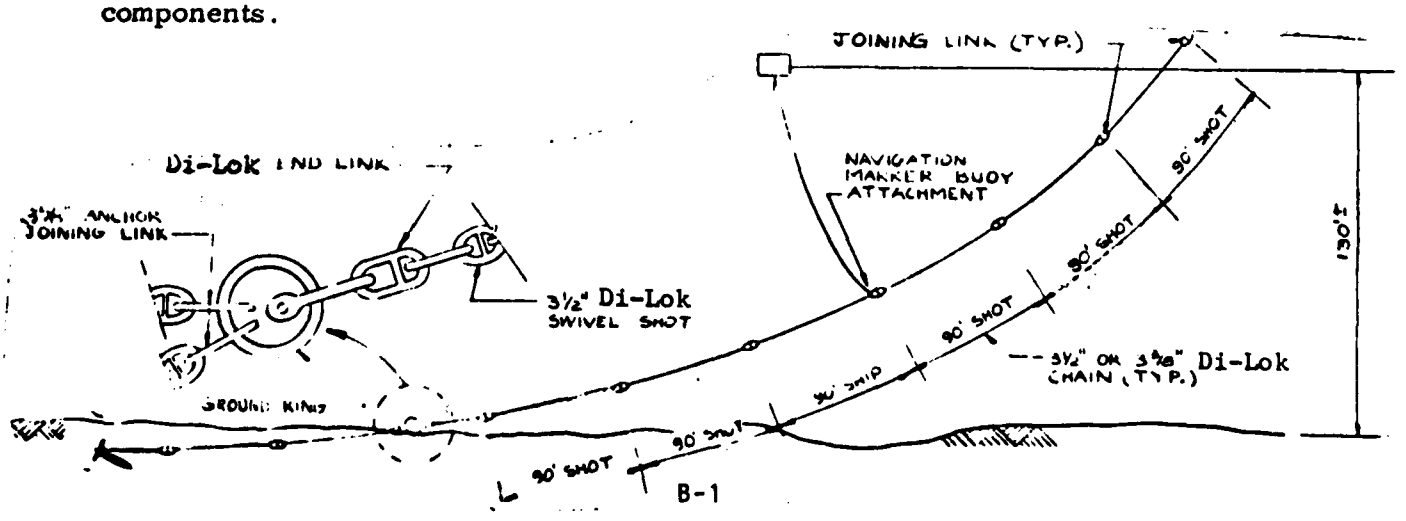
2.0 REFERENCE DATA:

Mooring Plan Drawings:	NAVFAC 4014059 Mediterranean Mooring NAVFAC 4014060 Mediterranean Mooring NAVFAC 4014061 Mediterranean Mooring NAVFAC 4014662 Mediterranean Mooring NAVFAC 401823 Cathodic Protection NAVFAC 1195707 Peg Top Buoy NAVFAC 1195708 Peg Top Buoy
Underwater Photographs:	Available from the CHESDIV Representative

3.0 GENERAL DESCRIPTION:

Existing data describe a two-buoy Mediterranean type bow mooring suitable for use with (AS) tender type vessels. Each peg type buoy is held in place by a single riser leg attached to a ground ring. Two ground legs attached to the ground ring terminate at 30,000-pound Navy stockless anchors. The La Maddalena mooring consists of Di-Lok type chain and has cathodic protection utilizing aluminum anodes. A representative drawing of the mooring is shown below.

The inspection scenario is to conduct an underwater TV investigation of the mooring under load conditions while the ship is moored. After departure of the ship, a crane barge will be used to lift a majority of riser chain on deck for detailed inspection. Buoys will be changed and a section of riser chain removed for evaluation. Physical measurements and galvanic readings will be made of the underwater components.



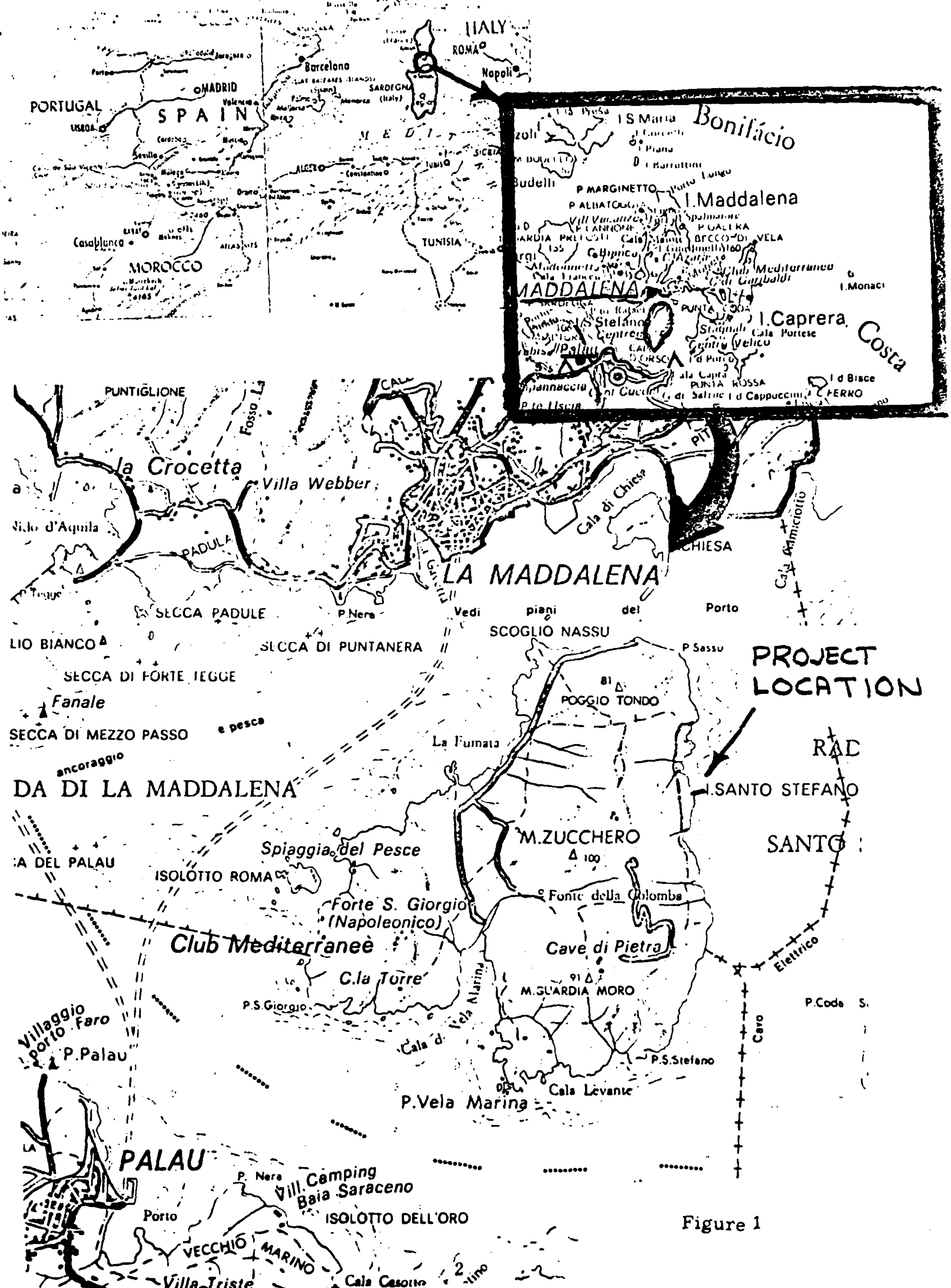

ITALY
ROMA
Napoli
Barcelona
MADRID
PORTUGAL
SPAIN
SARDEGNA (Italy)
TUNISIA
MOROCCO
Casablanca
Bonifácio
I.S Maria
I.Maddalena
P MARGINETTO
Budelli
P ALBATO
P GALERA
BECCO DI VELA
MADDALENA
I.Caprera
Costa
Stefano
PUNTA ROSSA
I d Bisce
FERRO
I d Cappuccini
I.Monaci
Cala Portese
PUNTIGLIONE
la Crocetta
Villa Webber
Nido d'Aquila
PADULA
Cala di Chiesa
CHIESA
LA MADDALENA
SECCA PADULE
P.Nera
Vedi piani del Porto
SCOGLIO NASSU
LIO BIANCO
SECCA DI PUNTANERA
SECCA DI FORTE TEGGE
Fanale
SECCA DI MEZZO PASSO
e pesca
ancoraggio
DA DI LA MADDALENA
P Sassu
POGGIO TONDO
La Fumata
PROJECT LOCATION
I.SANTO STEFANO
SANTO
M.ZUCCHERO
Spiaggia del Pesce
A DEL PALAU
ISOLOTTO ROMA
Fonte della Colomba
Forte S. Giorgio (Napoleonico)
Club Mediterraneè
Cave di Pietra
C.la Torre
M.GUARDIA MORO
Elettrico
P.S.Giorgio
P.Coda
Cavo
Villaggio Porto Faro
P.Palau
Cala di Vela Marina
P.S.Stefano
Cala Levante
P.Vela Marina
PALAU
P. Nera
Vill. Camping Baia Saraceno
Porto
ISOLOTTO DELL'ORO
VECCHIO MARINO
Villa Triste
Cala Casotto

Figure 1

4.0 INSPECTION PROCESS:

4.1 Survey and Inspection With Ship in Mooring - Using surface to diver communications, an initial underwater TV inspection will be conducted to establish a historical record of the existing condition of the mooring. The divers will also survey the mooring using an underwater magnetic compass, inclinometer, and depth gage to establish catenary profiles. The catenary angle will be measured at each 20 feet of depth as shown in Figure 2. In addition, the number of links separating the points of catenary angle measurements will be counted and recorded.

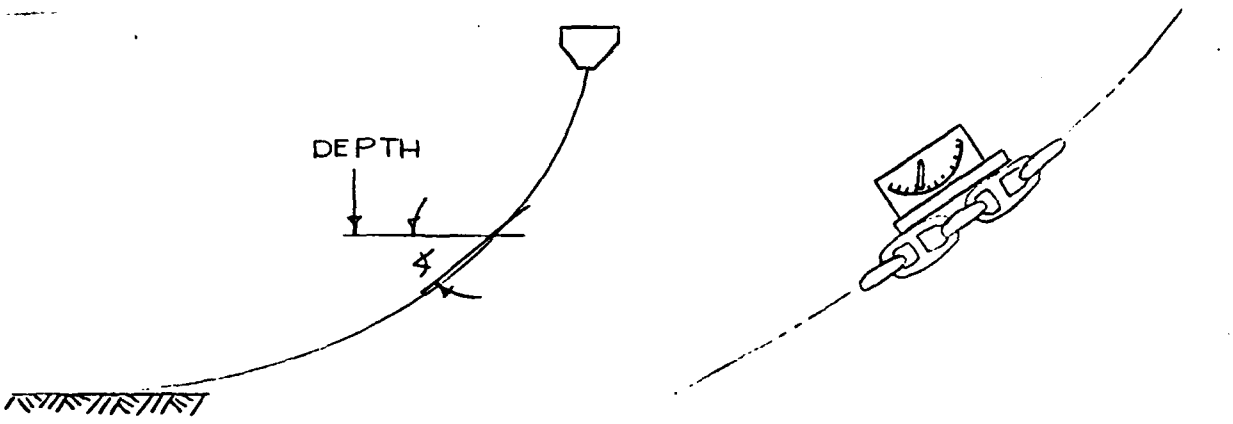


Figure 2

4.2 Inspection With Ship Away From Mooring - A YD lift craft will be provided through the Naval Support Office, La Maddalena. The YD will establish a moor suitable to lift each buoy. The YD will lift the buoy and a majority of the riser chain on to the deck. The riser chain will be lifted so as to bring the maximum amount of chain on deck without disturbing the position of the anchors. If for some unforeseen reason, the YD is unavailable, the mooring will be inspected and sample measurements taken underwater.

4.3 Buoy Inspection - The surface of each buoy will be inspected for areas of corrosion and/or damage.

a. Deck area - Document the condition of the finish and the condition of each hatch;

b. Sides - Document the condition of the fender system, the attachment hardware, and deformed areas of the buoy;

c. Underwater surfaces - Carefully clean three one square foot areas to expose the painted surface. Document the condition of the coating and metal surface (if exposed). Check the wear ring at the hawse pipe of the buoy for stressed areas. Determine the presence of a chain rubbing casting. Check for deformed underwater surfaces.

4.4 Riser Chain Removal - The riser chain must be disconnected in order to change the buoy. At this time, a 20-foot section of riser chain will be removed. A portion of the section will be returned to CONUS for a detailed inspection to determine the present strength of the chain and the effectiveness of cathodic protection.

4.5 Chain Link Inspection - Each shot (90') of the chain will be inspected either on deck or underwater and its wire diameter measured in three different locations in an effort to establish a sample of the average chain condition. At each location, the chain will be cleaned by whatever means required, to expose at a minimum a jointed pair of links. Specific measurements will be taken at each location as shown in Figure 3.

The riser chain has a second 3-3/8" Di-Lok chain connected to it approximately 130' from the bottom of the buoy. The riser chain has a welded connection as shown on drawing 4014060 and this connection will be specifically inspected for corrosion and cracks.

4.6 Ground Ring Assembly - Each ground ring assembly will be inspected as shown in Figure 4. The primary locations of inspection will be wear points between connecting links.

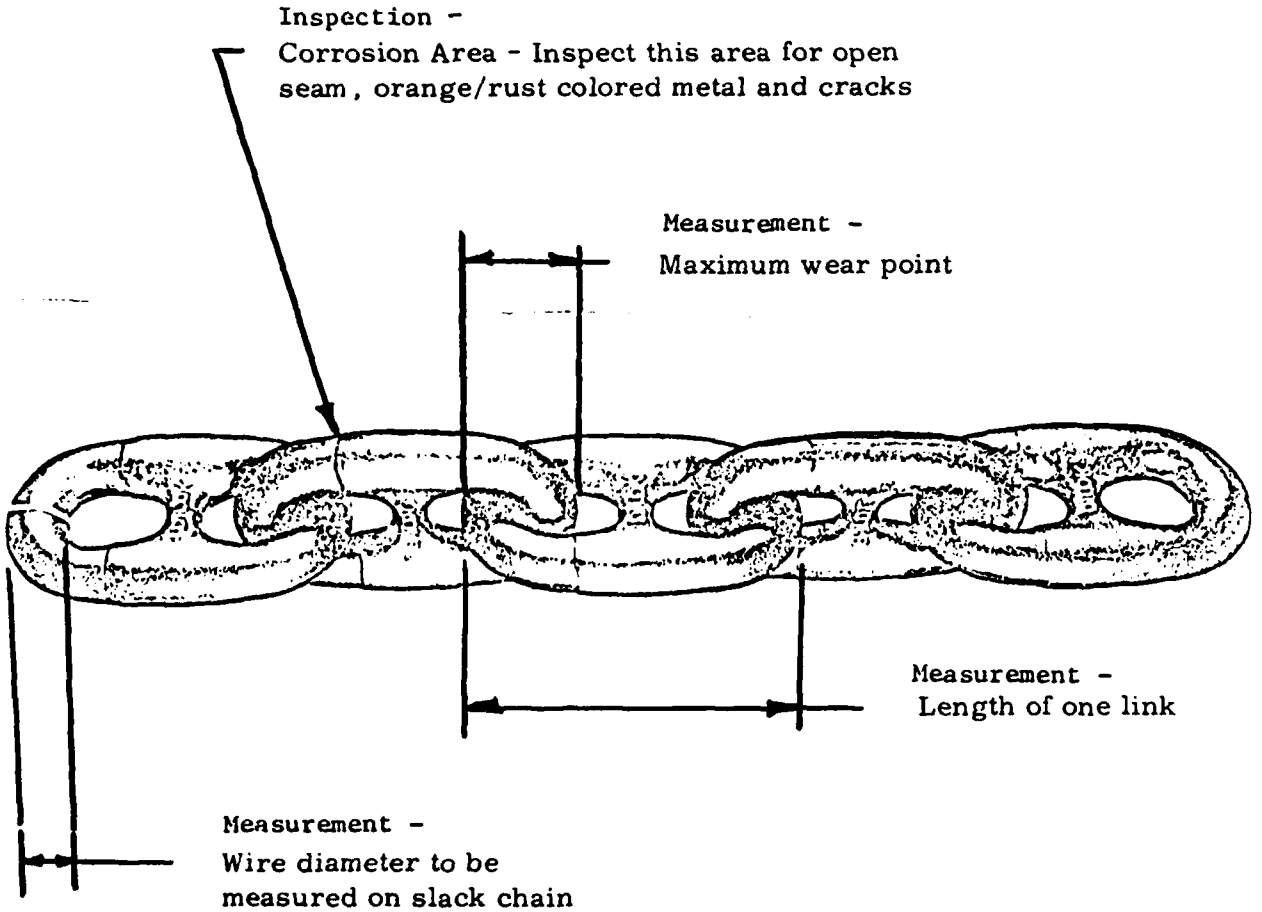
4.7 Ground Leg Chain - Ground leg chain will be inspected in the same manner as the riser chain. The ground leg chain is probably covered with bottom material for a substantial length. An attempt will be made to probe the bottom in order to follow the chain and locate the anchors. If an anchor position is located, its position relative to the buoy will be plotted. If the anchor cannot be located, its position can be estimated using the known position of the buoy relative to the ship, its catenary, and known length of the chain riser and leg.

4.8 Cathodic Protection System - The mooring riser leg and navigation buoy wire leg are protected by an aluminum anode system as shown on NAVFAC 4018523. The cathodic protection system will be inspected in detail to determine component location and system effectiveness.

The 3/4" diameter galvanized wire will be observed where it is passed between every fourth link. Contact between the wire and chain will be observed and the condition of the wire checked for breaks, kinks, frays, etc.

Every aluminum anode will be inspected for contact with the wire, condition of the stainless steel clamps, size of the anode, whether its deterioration is uniform or not, and the condition of the weld between the anode clamp and the chain link.

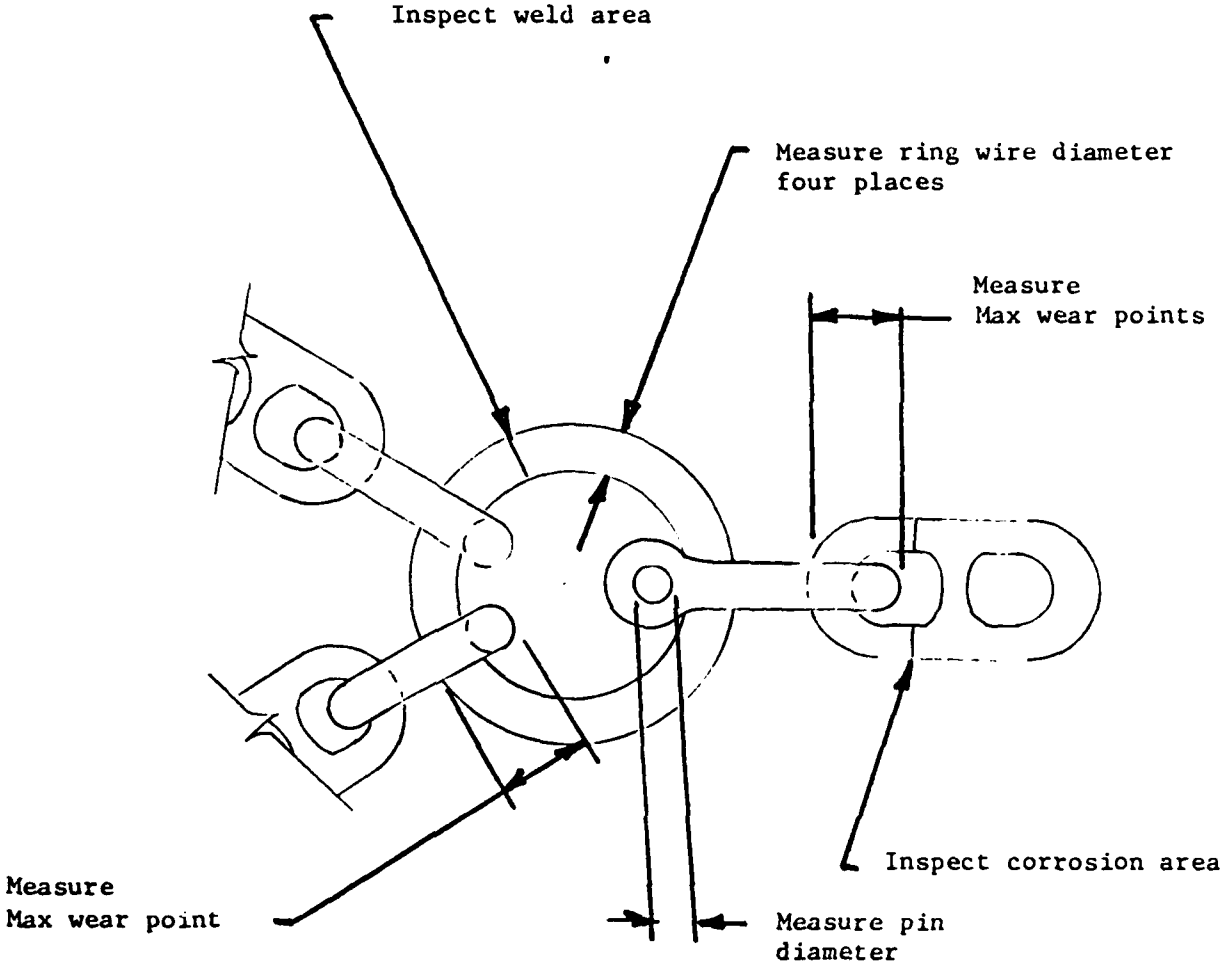
Specific measurements of electrical potential will be taken using a silver - silver chloride underwater voltmeter. Measurements will be taken on the chain at each anode and at two points between each anode. These measurements are to determine if adequate/continuous cathodic protection exists. If measurements indicate that cathodic protection is not adequate or continuous, additional measurements will be taken to determine the extent of this deficiency.



Note: Actual measurements will be taken with calipers.

Figure 3

Chain Inspection Points



Note: Actual measurements will be taken with calipers.

Figure 4

Ground Ring Assembly
Reference Drawing 4014060
for Detail

The marker buoy wire is protected by three 17-pound anodes as shown on NAVFAC 10485223. Previous inspections have documented that these anodes are loose or missing. A detailed inspection of the wire will be made to determine the specific condition.

4.9 Navigation Marker Buoys - Buoys are no longer in place. An inspection will be made to determine the location and condition of buoy hardware.

5.0 DOCUMENTATION:

The CHESDIV engineer will document the inspection procedures used and record the data obtained by the diving team. He will also recommend additional alternative inspection requirements as deemed necessary during the course of the inspection.

A diving photographer from the Combat Camera Group will deploy with UCT-1. Underwater still color photographs will include measurement data and photo position log data, and will be used to establish an historical record.

Underwater TV will be used to establish a detailed historical record of the existing conditions.

Surface color photographs will record operations techniques and surface hardware conditions.

While on site, the CHESDIV engineer will investigate and document the availability and costs of local mooring maintenance support. In addition, he will obtain an inventory and document the physical condition of any spare or surplus mooring equipment in storage at NSO La Maddalena.

6.0 MEETINGS/BRIEFINGS:

Upon arrival on site, a preliminary meeting will be held with station personnel to ascertain the latest information concerning the mooring and to establish project logistics.

A pre-dive briefing will be provided to familiarize all personnel with component design and inspection criteria.

A post-inspection briefing will be provided to advise station personnel of the preliminary inspection results.

After return to CONUS, presentations will be given to FPO-1 and LANTDIV personnel.

7.0 LOGISTICS:

UCT-1 will coordinate transportation of personnel and equipment to the site. On site support for berthing will be arranged through NSO La Maddalena by UCT-1. The moored tender will provide a dive boat equipped with surface supplied diving apparatus including surface/diver communications. The dive boat will remain on site after departure of the tender. The YD will provide the crane, acetelyne torches, and personnel required to change the buoys.

The following equipment will be provided on site by UCT-1 in support of the inspection.

- o All diving support equipment sets.

- o Measuring aids
  outside calipers 24-inch min.
  100' tape measures
  scales - 1, 2, and 3 feet with large numbers suitable for photo documentation
  go-no go gauges suitable for 3½" and 3-5/8" wire size chain
  accurate depth gauge (divers)

- o Survey equipment
  inclinometers (two)
  compass (divers)
  survey buoys with line (pop floats)

- o TV system (underwater)
  with lights and spare video tapes (10)
  generator for above, with fuel cans

- o Still cameras (35mm)
  with film (color and black/white), flash with spare batteries

- o Underwater voltmeter (2) with spare batteries, reference cell and operations manual

- o Cleaning equipment - hand tools including wire brushes, chipping hammers and sharp chisels. Water blaster with hose or hydraulic power supply and brush tool.

- o Waterproof paper

- o Lift bags, 2 - 2000#

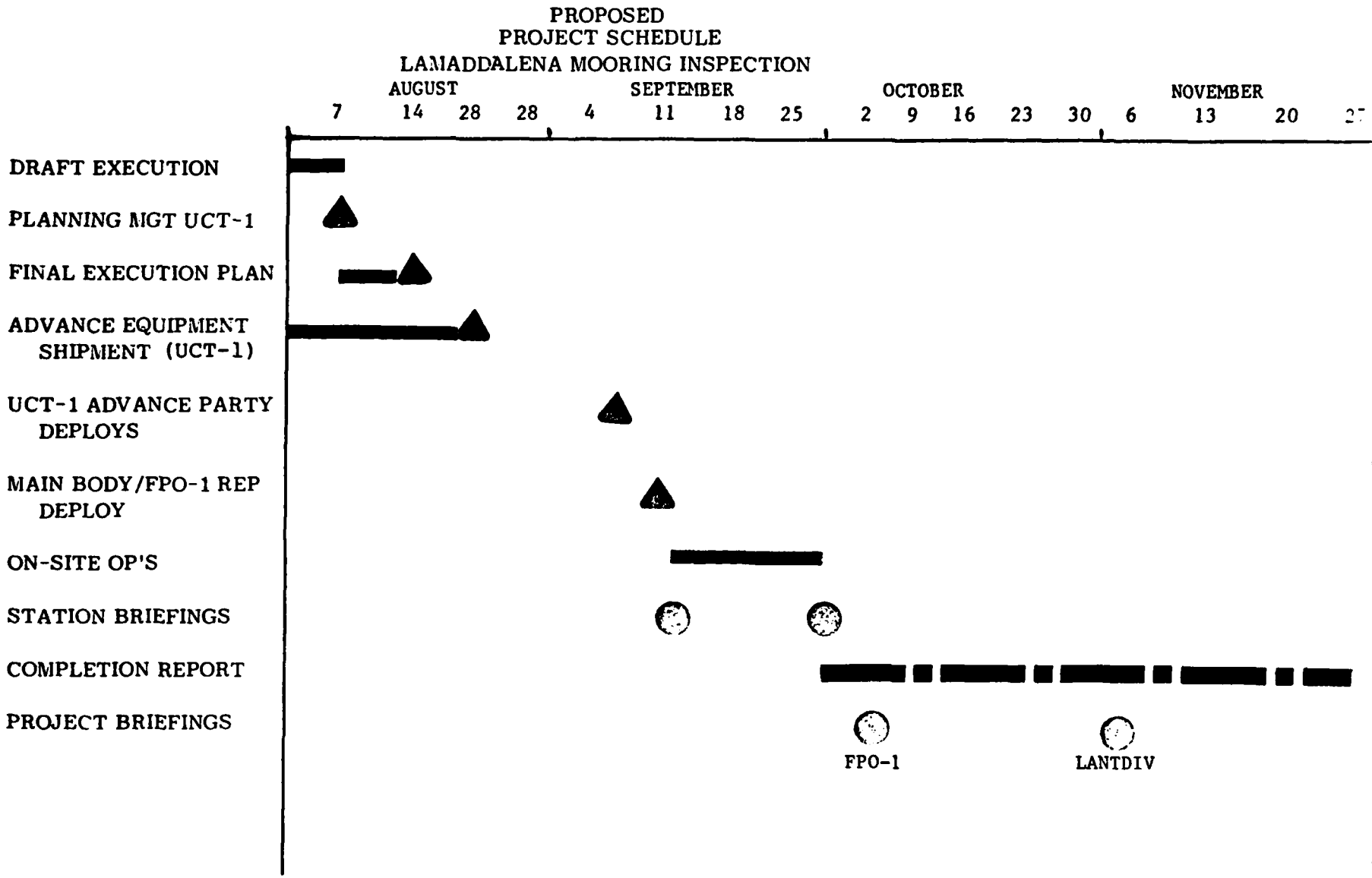
- o Marker tags - to relocate chain or mark links
- o Glass water sample jars
- o Maintenance hand tools, including strong bars, hacksaws, puller hoists cable cutters, shovels, rigging wire slings.

FPO-1 Representative Will Provide:

Inspection plan
Data sheets and log book
35mm underwater camera, flash and film
35mm surface camera and film
Drafting supplies, graph paper, scales, calculator
Full size drawings and previous inspection photographs
Pre-dive briefing data
Copy of DM-26

8.0 Transportation - Transportation of personnel and equipment will be the responsibility of UCT-1. The FPO-1 representative will travel with the team to the site.

9.0 Message Traffic - Summary status reports will be prepared on site by UCT-1 personnel and reported via message on a weekly basis to CHESDIV and UCT-1's homeport.


PROPOSED
PROJECT SCHEDULE
LAMADDALENA MOORING INSPECTION
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
7
14
28
28
4
11
18
25
2
9
16
23
30
6
13
20
DRAFT EXECUTION
PLANNING MGT UCT-1
FINAL EXECUTION PLAN
ADVANCE EQUIPMENT SHIPMENT (UCT-1)
UCT-1 ADVANCE PARTY DEPLOYS
MAIN BODY/FPO-1 REP DEPLOY
ON-SITE OP'S
STATION BRIEFINGS
COMPLETION REPORT
PROJECT BRIEFINGS
FPO-1
LANTDIV

APPENDIX C
SAMPLE PHOTOGRAPHS

This Annex contains photographs which depict the condition of the La Maddalena Fleet Mooring.

Figure C-1. Southern mooring link #59. Anode disconnected from the chain but still attached to the continuity cable. Marine growth is typical of that attached to the chain in the upper water column.

Figure C-2. Northern mooring riser chain being lifted at two points by the YD's crane. Note disconnected anodes and loose wire rope continuity cable.

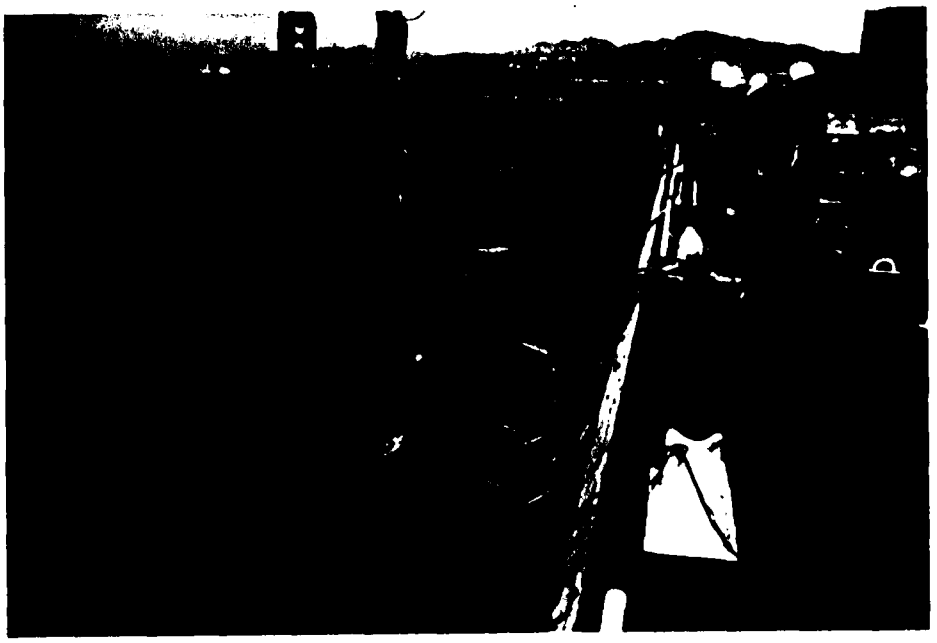


Figure C-3. Northern riser chain showing loose "second shot" sinker, disconnected anode, and "U" strap welded to a chain link.

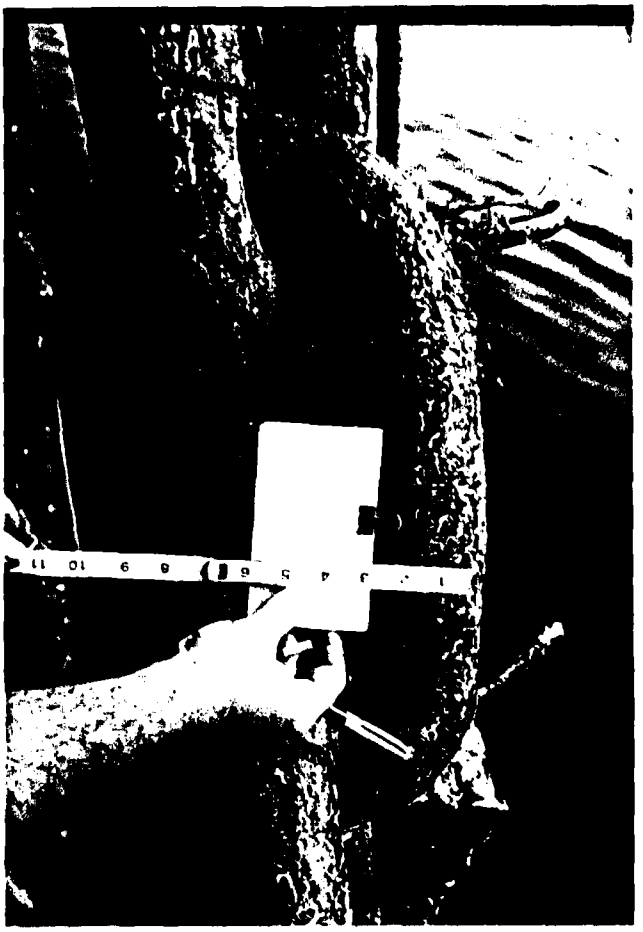


Figure C-4. Southern mooring link #92. Note anode attachment brackets welded to the link and anode hanging by the continuity cable.

Figure C-5. Southern mooring link #133. "U" strap welded link with old navigation buoy connecting wire attached.

Figure C-6. Northern mooring riser chain with anode attached. The "U" strap welded to the chain link is no longer connected to the "double shot" sinker.

APPENDIX D

RELATED CORRESPONDANCE

ROUTINE

R 301633Z MAR 81

FM COMCBLANT NORFOLK VA

TO CINCUSNAVEUR LONDON UK

INFO CINCLANTFLT NORFOLK VA
CHESNAVFACENGCOM WASHINGTON DC
NAVACTDET HOLY LOCH UK
LANTNAVFACENGCOM NORFOLK VA
NAVSUPPO LA MADDALENA IT
UCT ONE

BT
UNCLAS //N04070//

SUBJ: FLEET MOORING INSPECTIONS

A. CINCUSNAVEUR LONDON UK 231723Z FEB 81
B. FONECON OF 27 FEB COR NASH (COMCBLANT)/LCDR LEMON (CINCUSNAVEUR)
C. NAVSUPPO LA MADDALENA IT 111000Z DEC 80 (NOTAL)

1. REF A DISCUSSED CINCUSNAVEUR FLEET MOORING INSPECTION PRIORITIES AND REQUESTED UCT ONE INVOLVEMENT TO REDUCE COSTS AND MAXIMIZE INSPECTION EFFORTS.

2. PER REF B, UNDERSTAND FUNDING HAS BEEN SUBSEQUENTLY IDENTIFIED TO ACCOMPLISH NAVACTDET HOLY LOCH WORK UTILIZING MOD ADMINISTERED ASSETS.

3. ANTICIPATE UCT ONE WILL BE AVAILABLE IN SEP 81 TO SUPPORT NAVSUPPO LA MADDALENA. PER RECENT TECHNICAL DISCUSSIONS BETWEEN LANTDIV, COMCBLANT, UCT ONE AND CHESDIV (FPO-1), IT IS UNDERSTOOD THAT FPO-1 WILL BE ASKED BY LANTDIV TO REVIEW THE CATHODIC PROTECTION PROBLEM NOTED IN REF C AND TO PROVIDE ENGINEERING SUPPORT FOR THE DETAILED DIVER INSPECTION.

4. POC FOR COMCBLANT/UCT ONE IS LCDR BRANDENBURG, TELEPHONE 804-464-7447, AUTOVON 680-7447.
BT

DLVR:CHESNAVFACENGCOM WASHINGTON DC(8)...INFO

RTD:000-000/COPIES 0008

008579/089 1 OF 8 M1 0193 089/20:44Z 301633Z MAR 81
ON:RXOY00202 COMCBLANT NORFOLK VA

UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
U U N C L A S S I F I E D U
UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA 23511

TELEPHONE NO.
AUTOVON 690-7121
444-7121
IN REPLY REFER TO:
1018:RPT
11153

16 APR 1981
3161

From: Commander, Atlantic Division, Naval Facilities Engineering Command
To: Commanding Officer, Chesapeake Division, Naval Facilities Engineering Command

Subj: Fleet Mooring Inspection, at LA MADDALENA, IT

Ref: (a) COMCBLANT NORFOLK 301633Z Mar 1981
(b) FONECON CHESNAVFACENGCOM (MR. A. Kurtz, FPO-1)/LANTNAVFACENGCOM (Mr. R. Tarr, Code 1018) of 2 Mar 1981

Encl: (1) As Built Drawings of Med Moor System at LA MADDALENA, IT

1. As outlined in reference (a), Underwater Construction Team One (UCT ONE) anticipates being deployed to LA MADDALENA IT in September 1981. The purpose of this deployment is to perform a complete inspection of the fleet moorings from which overhaul criteria can be determined.

2. As discussed in reference (b). It is requested that FPO-1 provide engineering support in the development of diver inspection criteria, and also review problems associated with cathodic protection system. Enclosure (1) is forwarded as requested in reference (b).

3. It is requested that a cost estimate for the engineering support by FPO-1 be forwarded to this Command.

C. F. CAMPEN
By direction

END

DTIC

6-86